

Colorado Potato Beetle

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Scientific Name: Coleoptera: *Chrysomelidae*,
Leptinotarsa decemlineata

Size: Adults are ~ 3/8 inch long by 1/4 inch wide; mature larvae are 1/2 inch long.

Color: The adult thorax is orange with black spots and the wing covers have five yellowish white and five black alternating stripes running lengthwise (Fig. 1); the larvae are reddish in color with two rows of black spots along each side (Fig. 2); and eggs are yellow (Fig. 3).



Fig. 1. Adult Colorado beetles (*Chrysomelidae*, *Leptinotarsa decemlineata*).

Description: The adult beetle is convex above; larvae are smooth, soft-bodied, and humpbacked; and individual eggs somewhat resemble small sausages standing on end.

Range and Plants Attacked: The Colorado potato beetle (CPB) is found in most regions of the United States except for the Pacific Coast. It feeds exclusively on the foliage of cultivated and wild plants in the nightshade family (*Solanaceae*). It is a major pest of potatoes, eggplant, and tomatoes and subsists on various weeds such as horse nettle and buffalo burr.



Fig. 2. Larvae of the Colorado beetle.



Fig. 3. Colorado potato beetle eggs on the underside of a leaf.

Life cycle: The CPB overwinters in the soil as an adult. In eastern Virginia, overwintering adults emerge in April from nearby woods, hedgerows, or fields in which last year's crop was grown. When temperatures are cool, the emerging beetles seek suitable host plants (potato in the early spring in Virginia) by walking, but are capable of flying long distances when temperatures warm up.

A female beetle may lay several hundred eggs in her lifetime. Oviposition usually begins by early May, and the eggs are laid in tight clusters of 30 to 60, usually on the underside of host leaves (Fig. 3). The eggs hatch within four to nine days. Larvae are usually found feeding in groups on the undersides of the leaves as they pass through four instars or molts.

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Larvae complete their growth in two to three weeks, and peak larval populations develop by mid- to late May when the mature larvae pupate underground in earthen cells. The pupal stage lasts from five to ten days before the summer, or first-generation, adults emerge in June.

The rate of development for each stage depends on the temperature. In eastern Virginia, potatoes are harvested in late June and July; and therefore, most of these first-generation adults will feed on the remaining potato foliage and then enter the soil to overwinter. Some of these adults, however, will produce a partial second generation on tomato, eggplant, fall potato, or other available, suitable foliage. In other states in which potatoes are grown continuously all summer, there is a substantial second generation. There is much overlap within a generation, and typically eggs, larvae, and adults can be found on host foliage at any given time within the season, although generally one stage predominates at a given time.

Description of Damage: Adults and larvae feed on foliage in the same manner (Fig. 4). If CPB adults are present early in the season, they will clip small tomato or eggplant transplants or the emerging potato shoots at the ground level. As the larvae grow, they disperse through the plant canopy and consume large portions of the foliage. Large (third and fourth instar) larvae and first generation adults are the stages that do the most damage. If population pressure is heavy, the larvae and adults will completely defoliate the host plant and then feed on the stems. Loss of foliage weakens the plant and consequently results in reduction of marketable yield (tubers, fruit).



Fig. 4. Damage to plants from Colorado potato beetle.

Organic/Biological Control: The spined soldier bug, *Podisus maculiventris* (Fig. 5), and the two-spotted stinkbug, *Perillus bioculatus* (Fig. 6), prey upon CPB eggs and larvae. Some beetles, specifically the ladybird beetle, *Coleomegilla maculata* (Fig. 7), and carabid beetles in the genus *Lebia* also prey on the eggs, and there are tachinid fly parasites in some regions. Soil-borne fungal pathogens such as *Beauveria bassiana* may cause high mortality of pupae and overwintering adults. None of these organisms, however, is capable of making an economic impact on large populations.



Fig. 5. The spined soldier bug (*Podisus maculiventris*).



Fig. 6. The two-spotted stinkbug (*Perillus bioculatus*).



Fig. 7. The ladybird beetle (*Coleomegilla maculata*).

The Organic Materials Review Institute (OMRI) certifies formulations of insecticides. OMRI-certified insecticides containing *Bacillus thuringiensis* San Diego, neem (azadirachtin), or cryolite are effective if applications are timed to coincide with peak egg hatch and small-larvae activity. The OMRI-certified formulation of spinosad, Entrust® (Dow AgroSciences LLC), is effective against both larvae and adults.

Cultural Control: Because the CPB feeds exclusively on solanaceous crops and disperses by walking when temperatures are cool, rotation to a nonsolanaceous crop is one of the most effective cultural control measures a producer can take. This is especially true in eastern Virginia, where the beetles often overwinter in the same fields in which they developed. Plastic-lined trenches along the side of a potato field where overwintering adults will enter are effective early in the season. Trenches should be at least 12 inches deep, with the sides having a slope of at least 46 degrees. A video explaining this and other alternative CPB control techniques in more detail is available from Cornell Cooperative Extension. A feasible option for small potato fields is spreading a thick layer of straw mulch after planting to create a favorable environment for the potatoes and an effective barrier to adult beetles. Mechanical control methods such as flaming also have been developed.

Chemical Control and Resistance Management:

The CPB's high reproductive capacity and its feeding exclusively on a few closely related genera of plants makes resistance to insecticides a problem. Growers should rotate to nonsolanaceous crops and avoid repeated applications of insecticides in the same chemical class with the same mode of action. Growers should consult their Extension service and current commercial insecticide recommendations because the recommendations change over time. Currently recommended materials include the neonicotinoids imidacloprid and thiamethoxam, of which there are various formulations that may be applied in the soil at planting, as potato-seed-piece treatments, or as foliar sprays. These materials may be applied as drenches to flats of tomato and eggplant transplants, and this technique provides effective protection for small transplants. Other effective materials include foliar sprays of spinosad, abamectin, and the materials listed under organic control. Older materials such as the organophosphates phosmet, phorate, and methamidophos; the organochlorine endosulfan; and numerous pyrethroids (esfenvalerate, permethrin, bifenthrin, cyfluthrin, lambda-cyhalothrin, etc.) may still provide effective control in regions where resistance is not a major problem.